Space Weather Technical Forecast

Issued on Tuesday, 24 October 2023 at 13:11 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: No significant activity.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity as recorded at GOES16 has been Low with only one C-class flare, a C2.3 peaking at 23/1957 UTC from the AR3468 region. There are currently three sunspot regions on the visible disc, all of which are small and magnetically simple.

No Earth-directed CMEs have been observed in available imagery.

Solar Wind / Geomagnetic Activity: The solar wind, as measured by ACE at L1, has been at Ambient levels, averaging around 350-380 km/s through the period. The solar wind density was at below average values. The Interplanetary Magnetic Field (IMF), Bt, was at weak levels, ranging between 5 and 7nT. The north-south component, Bz, varied weakly between +6 and -3nT. The phi angle was predominantly negative (towards the Sun), with brief positive periods. The resulting geomagnetic activity was Quiet (Kp0-1).

Energetic Particles / Solar Radiation: GOES16 high energy (greater than 10MeV) proton flux was at Background levels.GOES16 high energy (greater than 2MeV) electron flux was at Normal Background levels. The associated 24-hour fluence was well below the Active (1e8 integrated pfu) threshold. The observation at 24/0001UTC was 2.8e6 integrated pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to remain Low or Very Low, with an increasing chance of C-Class flares through the period.

Solar Wind / Geomagnetic Activity: No CMEs currently feature in the forecast. The forecast is for mainly Quiet (Kp0-2) geomagnetic activity. Up to two fast wind streams are due, a low confidence and low impact feature perhaps Day 1, and then a more probable coronal hole possibly arriving from Day 3 onwards, with a Slight Chance of G1 Minor Storm (Kp5) intervals by the end of the period.

Energetic Particles / Solar Radiation: High energy (greater than 10MeV) proton flux is expected to persist at Background levels. High energy electron flux (greater than 2MeV) is expected to remain at Normal Background levels, with a Slight Chance of a late rise from CH64's fast wind.

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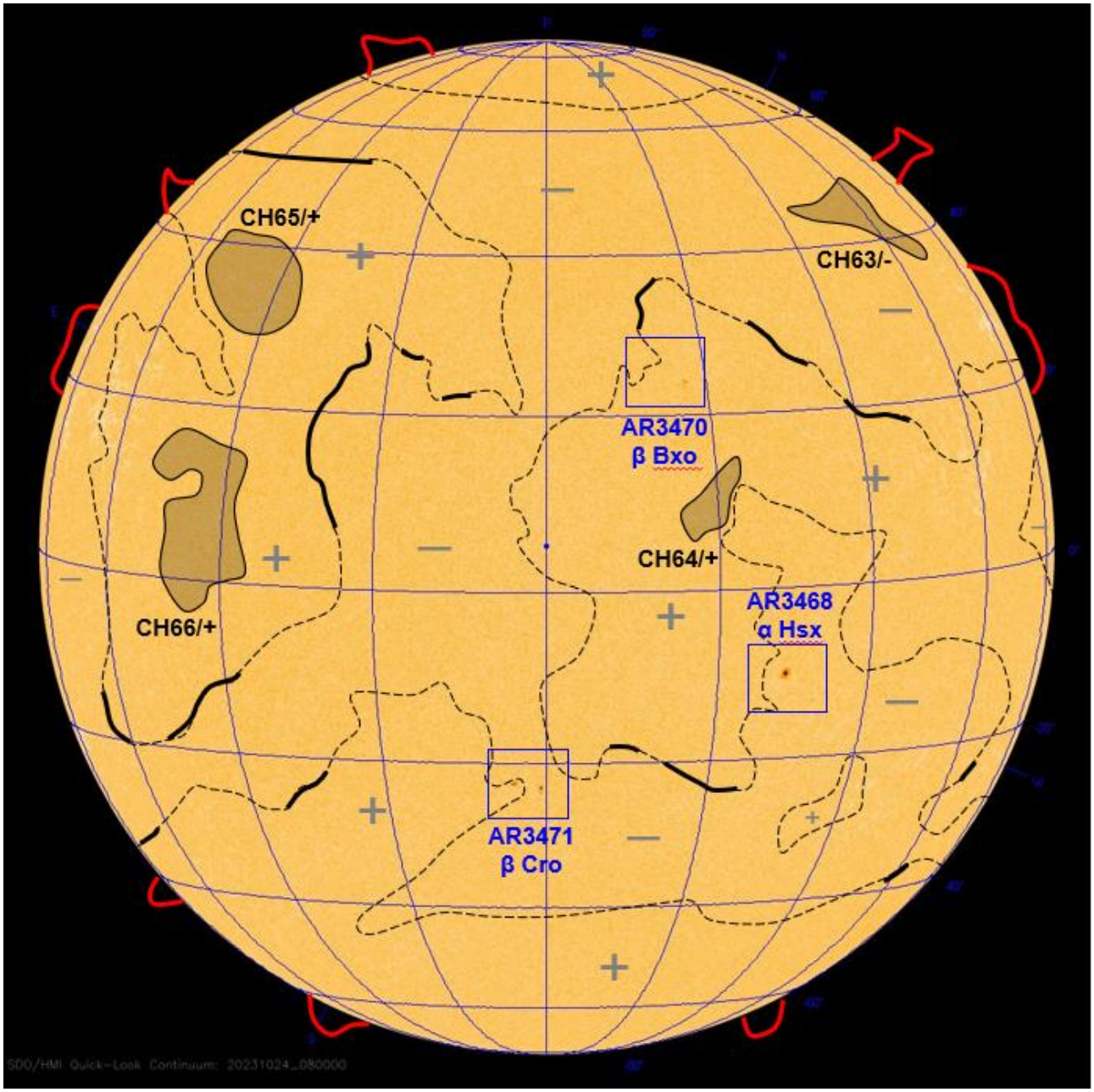
Figure 1. Solar Analysis Valid 24/0800 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

No CMEs currently feature in this four-day period.

Current background solar wind conditions may see potential enhancement from two coronal holes during the forecast period. CH63/- initially and then a later influence from CH64/+. CH63/- is the lower confidence feature for both presence and impacts, given its high solar latitude and negative polarity. CH64/+ is situated closer to the Suns equator, and may influence Earth during Day 3 (26 Sep), or more likely into Day 4 (27 Sep). This is a positive polarity feature and may give a greater risk of geomagnetic enhancement at this time of year. ENLIl model output shows likely this coronal hole high speed stream, albeit with a slightly later arrival time than mentioned above.

Geomagnetic activity is likely to be mainly predominantly Quiet (Kp0-2) over the coming period, with a Slight Chance of Unsettled to Active (Kp3-4) intervals at first increasing from Day 3 onwards due to CH64/+, and a Slight Chance of isolated G1 Minor Storm (Kp5) intervals by Day 4 (27 Sep).

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	5	10	20
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Nil

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Radio Blackouts - X-Ray Flares:
There are currently just three sunspot regions on the Earth-facing disc, and these are small and simple at the present time, with only AR3468 showing any recent flare activity. Far side sounding data suggests the potential for the active regions to round the eastern limb during the period and these will be monitored for any potential spot development.

Solar activity is expected to remain low but with a slowly increasing Slight Chance of isolated M-class flares forecast.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	5	5	5	10
Very Active	R3 to R5 X Class	No	1	1	1	1

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Solar Radiation Storms - (High Energy Protons):
The high energy (greater than 10MeV) proton flux observed by GOES16 is expected to persist at background levels in the absence of significant sunspot regions on the visible disc.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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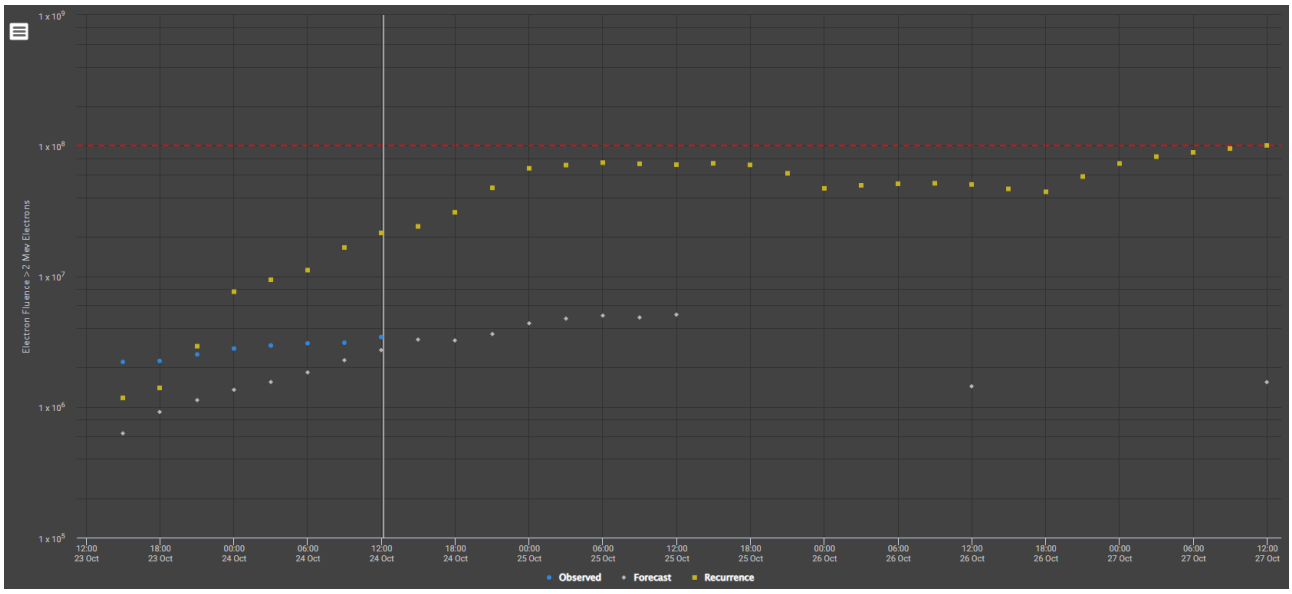
High Energy Electrons Event (≥ 2MeV):
Electron flux observed by GOES16 at GEO is currently at Normal Background levels and is very likely to remain here given the expected lack of CMEs and modest potency of inbound coronal holes' fast winds - at least until the possible arrival of CH64/+.

Persistence forecasting for the 24-hour fluence is polluted by CMEs influence on the last rotation, however the latest MOSWOC REFM is almost unmoved from current 24-hour fluence levels across its full 72-hour range. This may be expected to show more of an uptick due to the influence of CH64/+ from Day 3 onwards, however even this will probably fall short of Active levels.

GEO Electron Environment	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ $1x10^8$	No	1	1	5	10
Very Active	≥ 2 MeV ≥ $1x10^9$	No	1	1	1	1

Figure 2: Latest MOSWOC REFM model output



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